



Superfund Record of Decision:

**Koppers (Texarkana Plant)
(Amendment), TX**



NOTICE

The appendices listed in the index that are not found in this document have been removed at the request of the issuing agency. They contain material which supplement, but adds no further applicable information to the content of the document. All supplemental material is, however, contained in the administrative record for this site.

DECLARATION FOR THE AMENDED RECORD OF DECISION

**Statutory Preference for Treatment as a
Principal Element is Met
and Five-Year Site Review is Required**

SITE NAME AND LOCATION

Koppers Texarkana Site
Texarkana, Texas

STATEMENT OF BASIS AND PURPOSE

This decision document is based upon the administrative record file that supported the 1988 Record of Decision (ROD) and information received since the signing of the 1988 ROD, which is set forth in the attached administrative record file index. This document will supplement the existing 1988 ROD, thus creating one inclusive ROD which will govern the remediation activities planned for this site. This amendment will enable the Environmental Protection Agency (EPA) to implement the requirements contained in the fiscal year 1991 (FY91) Appropriations Conference Report and Bill, and in the FY92 Appropriations Bill, concerning this site.

Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. Section 9617 and 40 CFR 300.435 (c)(2)(ii), as amended in 1986, EPA is required to develop this document when fundamental changes to components of a selected remedy outlined in an approved ROD are needed. This document is issued by EPA as the Lead Agency responsible for remedying the contamination problems that exist at this site.

The State of Texas concurs on this amended remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in the 1988 ROD and this Amended ROD, may present an actual or potential threat to public health, welfare, or the environment.

DESCRIPTION OF THE AMENDED AND SELECTED REMEDY

Based on the Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 1991, Pub. L. No. 101-507, Title III, 104 Stat. 1351, 1373 (1990), hereafter cited as "FY91 Appropriations Bill", the Joint Conference Report to the FY91 Appropriations Bill, H.R. Conf. Rep. No. 101-900, 101st Cong., 2nd Sess. 35 (1990), hereafter "Conference Report", and the Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 1992 Pub. L. No. 102-139, Title III, 105 Stat. 736, 764 (1991), hereafter "FY92 Appropriations

Bill", EPA is amending the existing 1988 ROD to include: 1) buyout of the Carver Terrace Community located on the Koppers Texarkana Superfund site (Koppers) and, 2) relocation assistance for the affected residents. This action will include reclassification of the purchased residential area to non-residential use, and affirmation that the 100 parts per million (ppm) total carcinogenic polynuclear aromatic hydrocarbons (PAHs) action level is still appropriate to remediate the site.

The ROD signed on September 23, 1988 calls for an action level for removing greater than 100 ppm total carcinogenic PAHs in the soil to a depth of one foot, treatment of contaminated soils, and remediation of contaminated ground water in the upper aquifer (Stratum I). The contaminated ground water will be treated to levels equal to the Best Available Treatment Requirements (BAT) for the Organic Chemical, Plastics, and Synthetic Fibers Industry as specified in the 1988 ROD. Ground water cleaned to BAT will be reinjected into the aquifer along with surfactants to help recover the non-aqueous phase liquids (NAPLs). Ground water collection will continue until the NAPLs have been recovered to the maximum extent possible. This level will be determined during the Remedial Design based upon pilot testing of the collection and treatment system. After this point is reached, the ground water collection will cease and the ground water will be allowed to naturally attenuate to background levels. A sampling program will monitor the effectiveness of the selected remedy and provide data necessary to trigger future corrective action, if necessary. Based on information contained in the Remedial Investigation/Feasibility Study (RI/FS), an estimated 19,400 cubic yards of soil and 45 million gallons of groundwater will require treatment. The technology that will be utilized consists of mechanical soil washing, and oil/water separation and either carbon adsorption or fluidized carbon bed treatment of contaminated ground water.

The 1992 Inclusive Amended Remedy (the 1988 ROD and this buyout amendment), will be addressed in three operable units. The first operable unit will involve purchasing the homes and providing relocation assistance. The second operable unit will involve the destruction, removal and disposal of the structures and debris to the appropriate facility, the excavation and treatment of contaminated soils, and replacement of the excavated areas with clean fill. The third operable unit will be the treatment of the contaminated ground water to standards contained in the 1988 ROD. The remediated area will be limited to non-residential use through deed restrictions and zoning changes. Also, the remediated area will be fenced and allowed to return to its natural state until such time that the State of Texas and/or the City of Texarkana plan to utilize the property consistent with land use limitations called for in this ROD amendment.

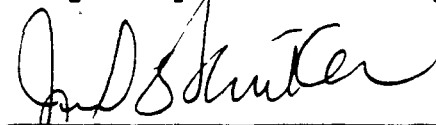
This amendment to the 1988 ROD will not alter the intent of the 1988 ROD, with respect to the remediation of the site. However, it will change the land use to non-residential, include institutional controls, and permanently relocate the residents.

DECLARATION

This ROD amendment for the site is based on the FY91 Appropriations Bill and Conference Report for EPA, the FY92 Appropriations Bill, and community acceptance.

The remedy selected in 1988 along with this amendment, is protective of public health and welfare and the environment, and complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action. The 1988 remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable, satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element, and is cost effective.

Because the 1988 remedy along with this amendment will result in hazardous substances remaining on site (i.e., residual subsurface soils contaminated with PAH compounds with concentrations less than 100 ppm, and long term treatment of contaminated ground water), a review will be conducted at least every five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of public health and the environment.



for B. J. Wynne
Regional Administrator
Region VI

March 4, 1992
Date

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AMENDED
RECORD OF DECISION

Koppers Texarkana
Superfund Site



Region 6

REPORT DOCUMENTATION PAGE		1. REPORT NO. EPA/ROD/R06-92/068	2.	3. Recipient's Accession No.
4. Title and Subtitle SUPERFUND RECORD OF DECISION Koppers (Texarkana Plant) (Amendment), TX First Remedial Action - Amendment				5. Report Date 03/04/92
7. Author(s)				6.
9. Performing Organization Name and Address				8. Performing Organization Rept. No.
				10. Project/Task/Work Unit No.
				11. Contract(C) or Grant(G) No. (C) (G)
12. Sponsoring Organization Name and Address U.S. Environmental Protection Agency 401 M Street, S.W. Washington, D.C. 20460				13. Type of Report & Period Covered 800/000
15. Supplementary Notes PB93-964208				14.
16. Abstract (Limit: 200 words) <p>The 62-acre Koppers (Texarkana Plant) site is a former wood treatment facility located in Texarkana, Texas. The site consists of a 34-acre residential area and a 28-acre former sand and gravel operation. The entire site lies within a 100-year flood plain. From 1910 to 1961, the Koppers Company treated wood onsite using PCP, creosote, and metallic salts. After onsite operations ceased in 1961, the structures were removed and the property was sold for residential and industrial development. In 1964, Carver Terrace, Inc. developed the northern 34 acres of the site for residences. Kennedy Sand and Gravel Company owns the remaining southern 28 acres, which operated as a sand and gravel quarry from the late 1970s to 1984. In 1975, Mount Zion Missionary Baptist Church purchased a small portion of the site from Carver Terrace Inc. to construct a church. In 1980, an investigation conducted by both the state and the Koppers Company identified onsite soil and ground water contaminated with PCP, arsenic, and creosote. In 1985, EPA placed clean soil and sod on some of the yards in the subdivision as a protective measure to reduce exposure to contaminated</p> <p>(See Attached Page)</p>				
17. Document Analysis a. Descriptors Record of Decision - Koppers (Texarkana Plant) (Amendment), TX First Remedial Action - Amendment Contaminated Media: soil, sediment, debris, gw Key Contaminants: VOCs (benzene, toluene, xylenes), other organics (PAHs, PCP), metals (arsenic) b. Identifiers/Open-Ended Terms c. COSATI Field/Group				
18. Availability Statement		19. Security Class (This Report) None		21. No. of Pages 45
		20. Security Class (This Page) None		22. Price

EPA/ROD/R06-92/068

. .Koppers (Texarkana Plant) (Amendment), TX
First Remedial Action - Amendment

Abstract (Continued)

soil. A 1988 ROD provided for onsite treatment of contaminated soil using soil washing and treating the ground water and non-aqueous phase liquids (NAPLs) using oil/water separation and carbon treatment. However, the remedial action was not initiated because of a Congressional mandate set forth in the Conference Report to the FY92 Appropriations Bill stipulating that EPA purchase homes located on the site and provide relocation assistance to the residents. This 1992 ROD amendment appends the provisions of the mandate to the remedy, as established in the 1988 ROD. The primary contaminants of concern, as provided in the 1988 ROD, affecting the soil, sediment, debris, and ground water are VOCs, including benzene, toluene, and xylenes; other organics, including PAHs and PCP; and metals, including arsenic.

The amended remedial action for this ROD includes implementing all treatment actions provided for in the 1988 ROD, which include onsite soil washing as well as treatment of ground water using an oil and water separator and granular activated carbon treatment purchasing onsite residences; permanently relocating affected residents; demolishing homes and removing and disposing of debris offsite; implementing institutional controls, including deed and land use restrictions; and reclassifying the property from residential to non-residential use. The estimated amended present worth cost for this remedial action is \$12,400,000, which includes an annual O&M cost ranging from \$316,200 to \$329,200 for 30 years.

PERFORMANCE STANDARDS OR GOALS:

Chemical-specific clean-up goals remain the same as those provided in the 1988 ROD. Soil clean-up goals include excavation to a 100 mg/kg action level of total carcinogenic PAHs based on a risk level between 10⁻⁶ and 10⁻⁴. Ground water clean-up goals are not provided but were based on Best Available Treatment Requirements (BAT) for the Organic Chemical, Plastics, and Synthetic Fibers Industry.

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**DECISION SUMMARY
FOR THE
KOPPERS TEXARKANA SITE
TEXARKANA, TEXAS**

I. INTRODUCTION

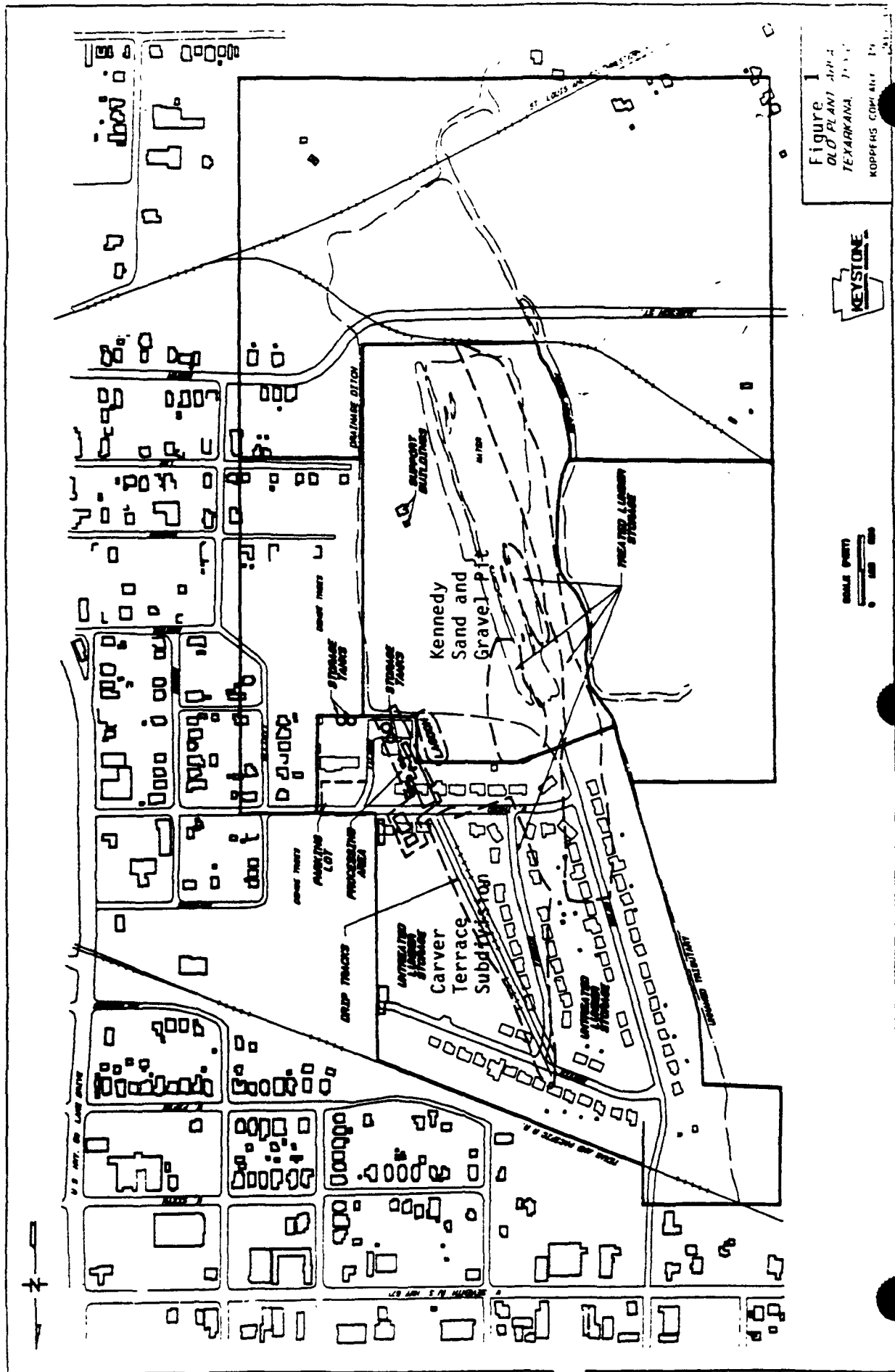
This Amended Record of Decision (ROD) presents the specific changes that will become a part of the selected remedy discussed in the Koppers Texarkana site ROD signed on September 23, 1988. Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. Section 9617 and 40 CFR 300.435(c)(2)(ii), as amended in 1986, the Environmental Protection Agency (EPA) is required to develop this document when fundamental changes to components of a selected remedy outlined in an approved ROD are needed. This document is issued by EPA as the Lead Agency responsible for remediating the contamination problems that exist at this site.

II. SITE HISTORY AND CONTAMINATION PROBLEMS

The Koppers Texarkana site is located in a 100 year flood plain, in Texarkana, Texas, approximately one mile west of downtown Texarkana. The site consists of 62 acres and is a former wood treatment facility which began operations in 1910. The operation area consisted of a drip track, treated and untreated wood storage areas, wood treating cylinders, chemical storage tanks, and a waste water lagoon (Figure 1). The chemicals used to treat the timber included pentachlorophenol (PCP), creosote, and metallic salts. Operations ceased in 1961, the structures were removed, and the property was later sold for residential and industrial development. During 1964, Carver Terrace, Inc. purchased 34 acres and subsequently constructed 79 homes on the northern half of the site, which is known as the Carver Terrace subdivision. The remaining 28 acres on the southern half of the site were sold to the Kennedy Sand and Gravel Company which mined sand and gravel from the late 1970's to 1984. In 1975, Mount Zion First Missionary Baptist Church purchased a half-acre tract on the southern half of the site from Carver Terrace, Inc. and built a church.

In 1980, the State of Texas and the Koppers Company found that the soil and ground water were contaminated with chemicals commonly used to preserve wood; PCP, arsenic, and creosote. In 1984, EPA placed the Koppers Texarkana site on the National Priorities List.

As a protective measure in 1985, clean soil and sod were placed on some of the yards in the subdivision to prevent residents from being exposed to contaminated soils until the remedial action is implemented. A Remedial Investigation and Feasibility Study (RI/FS) was also conducted on the site in February 1985. The RI determined the types, amounts, and location of the contaminants. The FS identified and screened remedial alternatives for site remediation



and analyzed in detail the technology and costs of the alternatives.

A risk assessment was also conducted to define the pathways of potential exposure to contaminants and establish action levels for the soil that are protective of public health.

1988 Selected Remedy

The ROD signed on September 23, 1988, calls for removing greater than 100 parts per million (ppm) total carcinogenic polynuclear aromatic hydrocarbons (PAHs) in the soil to a depth of one foot, treatment of contaminated soil, and remediation of contaminated ground water in the upper aquifer (known as Stratum I). It assumes the residents will continue to reside in the Carver Terrace subdivision, and deems the 100 ppm action level to be protective for residential use. Contaminated ground water is to be treated to levels equal to the Best Available Treatment Requirements (BAT) for the Organic Chemical, Plastics, and Synthetic Fibers Industry. Ground water cleaned to BAT will be reinjected into the aquifer along with surfactants to help recover the non-aqueous phase liquids (NAPLs). Ground water collection will continue until the NAPLs have been recovered to the maximum extent possible. This level will be determined during the Remedial Design based upon pilot testing of the collection and treatment system. After this point is reached, the ground water collection will cease and the ground water will be allowed to naturally attenuate to background levels. A sampling program will monitor the effectiveness of the selected remedy and provide data necessary to trigger future corrective action, if necessary. The 1988 ROD estimated that approximately 19,400 cubic yards of soil and 45 million gallons of ground water will require treatment. The technology that will be utilized consists of mechanical soil washing, and oil/water separation and either carbon adsorption or fluidized carbon bed treatment of contaminated groundwater. The 1988 projected cost to implement this remedy is \$6.4 million.

III. ENFORCEMENT ACTIVITIES AND OTHER SITE RELATED ACTIVITIES

During November 1989, EPA initiated the negotiations for implementing the 1988 ROD to conduct the Remedial Design/Remedial Action (RD/RA) for the Koppers site with several potentially responsible parties (PRPs). However, in February 1990, Region 6 suspended the RD/RA negotiations with the PRPs in order to reevaluate the action level for the residential portion of the site. This decision was primarily based upon the findings discovered during a review of the 1988 risk assessment that was developed for the site. The 1988 risk assessment was developed in compliance with EPA risk assessment guidelines in effect in 1988. Upon review in 1990, it was observed that the exposure assumptions used to derive the action level for contaminated soil in 1988 were not reflective of a residential subdivision occupied by residents on a continuous basis, and therefore needed further refinement. Furthermore, revising the 1988 action level using 1989

guidelines would provide a more protective action level. Through the use of a fact sheet, a door to door visit with the residents that was conducted on April 24-25, 1990, and a workshop that was held on April 26, 1990, Region 6 informed the public that the Agency intended to: 1) revise the action level established in the 1988 ROD for the residential area, to a level that was reflective of a residential subdivision that is occupied by residents on a continuous basis, and 2) separate the RD/RA into two phases. Phase I consisted of a fast track removal in which contaminated soil in the Carver Terrace subdivision would be excavated and replaced with clean fill. Phase II would have been the actual treatment of the contaminated soil and ground water.

Upon reevaluating the data collected from the Remedial Investigation and applying 1989 exposure assumption guidance, EPA derived the 1990 revised action level for remediating the residential portion of the site. EPA determined the 1990 revised action level to be .33 ppm benzo(a)pyrene equivalent for a residential area. This level provided the necessary protection of human health and eliminated the potential threat of long term exposure from contaminants in the subsurface soils.

Also during the month of April 1990, the Agency for Toxic Substances and Disease Registry (ATSDR) issued a health assessment for the Koppers site. In response to concerns raised by the citizens, Members of the United States Congress reviewed this report to determine if there was a need to purchase the property of the residents.

EPA and ATSDR have always agreed on the long term health threats posed by the site. The concerns viewed by the citizens stemmed from the interpretation of language contained in ATSDR's April 10, 1989, health assessment of the site. Specifically, ATSDR's health assessment stated "Long-term exposures to contaminated soils in the residential area pose a potential health risk for ingestion and dermal absorption of soil contaminants". The assessment further stated that "the remedial action previously taken by EPA to safeguard the health of residents until final cleanup, is not sufficiently protective of public health".

The remedial action ATSDR referred to, is actually a removal action that was completed by EPA in 1985. This removal action consisted of removing soil in yards that had concentrations of benzo(a)pyrene greater than 325 ppm, replacing with clean fill and then resodding. This action alleviated any imminent and substantial endangerment by acting as a protective barrier until the final remedial action could be taken. ATSDR's statement that the removal action was not "sufficiently protective" meant that further action or remediation will be required to remove long-term threats, which EPA plans to do.

In the following months, Region 6 met with the primary PRP on several occasions to discuss implementing the 1988 remedy utilizing the 1990 revised action level of .33 ppm benzo(a)pyrene equivalent. In August,

this PRP submitted to EPA, a draft statement of work which discussed the implementation of the fast track RD/RA excavation activities (Phase I). This draft SOW assumed the residents would remain in the subdivision. Through September 1990, Region 6 pursued plans to implement the fast track removal of contaminated soils.

The cost projected to implement the original 1988 remedy as stated in the ROD is approximately \$6.4 million. The projected costs to implement the remedy using the 1990 revised action level would have increased the cost of remediation by an estimated cost of \$1.173 million (see Attachment 1), bringing the total cost of remediation to approximately \$7.573 million. These costs assumed the residents would remain in the subdivision.

EPA provided interested members of Congress with a copy of the new proposed plan, including the 1990 revised action level with the accelerated removal schedule, and advised Congress of the factors which led EPA to conclude that the selected remedy was protective of human health and the environment. However, in the Conference Report to the FY91 Appropriations Bill, Congress called upon Region 6 to purchase the homes located on the Koppers Texarkana Superfund site in Texarkana, Texas, and provide relocation assistance to the residents. The Conference Report embodied provisions of the FY91 Appropriations Bill for EPA, among other federal agencies, which was signed into law on November 5, 1990. EPA Region 6, in accordance with the Congressional mandate set forth in this report, terminated efforts to implement the 1990 revised action level for the residential portion of the site, and instead, pursued measures to implement the buyout. EPA issued an Amended Proposed Plan (Plan) to the public in January 1991, that: 1) identified the changes that would modify the selected 1988 remedy and 2) explained the reasons for amending the 1988 ROD to include a buyout. A public meeting was conducted on January 22, 1991, to discuss this Plan and receive community input. The public comment period started January 15, and was extended until April 1, 1991, to allow the primary PRP the opportunity to comment on the Plan. The FY92 Appropriations Bill that was subsequently passed, requires for EPA to implement the Koppers buyout. The FY92 Bill states, "...notwithstanding any other provision of law, the Administrator of the Environmental Protection Agency shall from funds previously appropriated under this heading in Public Law 101-507, obligate up to \$5,000,000 for Koppers Texarkana Superfund site relocation.", FY92 Appropriations Bill, Pub. L. No. 102-139, Title III, 105 Stat. 736, 763-4 (1990).

The Amended Proposed Plan of Action and this Amended ROD will not alter the intent of the 1988 ROD, with respect to the remediation of the site. However, there is a fundamental difference in that the Amended ROD calls for a permanent relocation of the affected population, and a change in the expected land use from residential to non-residential. Accordingly, the cost associated with the implementation of the amended remedy will change. In addition to the existing \$6.4 million remedy, the cost associated with the buyout is

projected to be \$5 million. Another cost is that cost associated with demolition of the homes and removal and disposal of the structures and debris to the appropriate facility (see Attachment 1). Thus, the charge associated with this activity is projected to cost \$960,000.

The amended remedy will consist of the provisions previously established in the 1988 ROD, and will include a buyout, the relocation of residents, reclassification of the land use of the residential portion of the site, demolition of the homes, and removal and disposal of the structures and debris in the appropriate facility. The remediated area will be limited to non-residential use through deed restrictions and zoning changes. Also, the remediated area will be fenced and allowed to return to its natural state until such time that the State of Texas and/or the City of Texarkana plan to utilize the property consistent with land use limitations called for in this ROD amendment. The total estimated cost required to implement the amended remedy is \$12.4 million.

IV. HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Amended Proposed Plan for the Koppers Texarkana site was released to the public on January 9, 1991. This document and the Amended ROD will be included in the administrative record. Notice of the public meeting on the Amended Proposed Plan of Action was published in the Texarkana Gazette on January 13, 1991. The public meeting was held on January 22, 1991, and the public comment period started January 15, 1991 and ended April 1, 1991. At the meeting, representatives from EPA and the U.S. Army Corps of Engineers (COE) discussed the contents of the Amended Proposed Plan, the time frame associated with the buyout and RD/RA activities, and the role the COE is expected to have when the buyout is implemented. Afterwards, both agencies entertained questions pertaining to the buyout. Representatives of the Texas Department of Health and the ATSDR were present and answered questions concerning the health study that would be performed in the community in March 1991. Representatives of the Texas Water Commission also attended this meeting and were available to answer questions. A court reporter was present to transcribe the meeting, and a copy of the transcript is included in the Administrative Record file. A response to the comments received during this period is included in the Responsiveness Summary (see Attachment 2).

The Administrative Record

This Amended ROD and the information received after the 1988 ROD was signed in September 1988, will be included in, and become a part of, the Administrative Record file.

The Administrative Record file for the Koppers Texarkana site provides a step by step summation of all of the actions that have been conducted at this site. It also supports and provides the basis for the Agency's decision in selecting and amending the 1988 remedy. The

record file is available for review at the EPA office in Dallas and at the following repositories:

Texarkana Public Library	Monday - Wednesday
600 West Third Street	9 a.m. until 9 p.m.
Texarkana, Texas 75501	Thursday - Saturday
(214) 794-2149	9 a.m. until 6 p.m.

Texas Water Commission	Monday - Friday
Library - Basement	8 a.m. until 5 p.m.
1700 Congress	
Stephen F. Austin Bldg.	
Austin, Texas 78711	
(512) 463-7834	

V. BASIS FOR ISSUING THE AMENDED ROD

It has long been the belief of many of the residents of this area, that this site is affecting their health. The Carver Terrace subdivision is located on the Koppers Texarkana Superfund site, which is situated in a low lying area that is part of a 100-year flood plain. This particular subdivision has been plagued by numerous floods because of its location in a flood plain and because of its lack of a proper drainage structure. Severe floods, compounded by the fact that this community was built on a Superfund site, have heightened the fears of the residents who believe they are being exposed to hazardous substances.

Despite the efforts made by the Agency to assure the community that a short-term health threat does not exist at the site, the community continued to express their concerns involving the impact that the site was having on their health to various city, state and federal government officials. Community grievance intensified with the delays the Agency experienced in implementing the RD/RA, the amount of time that had lapsed before the community obtained a copy of the ATSDR health assessment for the Koppers site, and the perceived inconsistency of ATSDR's assessment of the site, with EPA's own evaluation. Attempts were made by both EPA and ATSDR representatives to discuss and resolve the perceived inconsistency viewed by the residents and citizens concerning this assessment, but all efforts were unsuccessful. In response to the community's urgency for a buyout, Congress reviewed ATSDR's assessment for the site and amended the Appropriation Bill for the Departments of Veterans Affairs and Housing and Urban Development and Independent Agencies to include \$5 million for the purchase of the homes on this Superfund site and relocation assistance for the residents. The decision to amend the 1988 ROD is based on the contents of the Conference Report to the FY91 Appropriations Bill, the language requiring EPA to conduct a buyout which is contained in the FY92 Appropriations Bill, and community acceptance.

**VI. DESCRIPTION OF THE CHANGES ASSOCIATED
WITH THIS AMENDED RECORD OF DECISION**

The buyout amendment will require certain components of the remedy selected in 1988 to change. First, the original ROD and the revised action level for the residential portion of the site that was under consideration, were designed to implement the remedy selected in 1988 with the intent that the residents would continue to live in the subdivision. Under this buyout, the residents will be permanently relocated. Another change associated with this buyout is that future use of the residential property will be changed to disallow any further residential development, once the existing homes have been removed. Reasons for this measure are: 1) the remediation that will be implemented on the property will leave residual contaminants in subsurface soil, that would not be protective for long term residential use, 2) the site area is prone to frequent flooding, therefore, future development is not advised unless measures are taken to prevent flooding, and 3) the City of Texarkana and the community's desire that the area not remain residential.

During a meeting conducted on January 31, 1991 in Texarkana, Texas, representatives of EPA, the Texas Water Commission, the General Land Office for the State of Texas, and the City of Texarkana discussed potential land uses for the property once the buyout was completed. The City expressed at this meeting and on several other occasions that they would not support future residential development of the property, because of the flooding problem. However, the City does want the possibility of using the land for industry, and stated it would be willing to assist in zoning the property for non-residential use after the remedial action is complete. The institutional control of zoning that the City could provide is considered important to insuring that future land use be non-residential.

By classifying the property as non-residential use, the action level of 100 ppm carcinogenic PAHs would allow for industrial, trespassers, wetlands or abandonment scenarios. However, if the property is to be utilized in the future for industrial or commercial purposes it is highly advised that flood protection be provided since this remedy does not provide for any such protection.

The classification of the residential portion of the site will be changed to non-residential use. This classification will facilitate implementation of the amended remedy, and enable the State of Texas (which will accept title to the former residential property) to utilize the remediated property consistent with the land use limitations called for in this ROD amendment. EPA will work closely with City and State officials to ensure that their concerns on any phase of the remediation are addressed consistent with the NCP. Also, EPA will work with the State of Texas and the City of Texarkana to have this property reclassified. Finally, EPA has reevaluated the effectiveness in utilizing the 1988 action level of 100 ppm carcinogenic PAHs, to remediate the reclassified portion of the site.

The evaluation confirmed the 1988 action level is acceptable for non-residential use; consequently, the basic approach to contaminant remediation in the 1988 remedy will not change.

In summary, the two fundamental changes from the 1988 ROD are:

1) the buyout of the Carver Terrace Community, including relocation assistance to the residents, demolition of the homes, and removal and disposal of debris in the appropriate facility, and 2) the reclassification of the property from residential to non-residential use, and the affirmation that the 100 ppm carcinogenic PAHs action level is still appropriate to remediate the site, and will provide long term protection of human health, and the environment.

Implementation of the Changes

To implement the buyout, using Fund monies, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) requires the State to match 10 percent of the funds, and agree to accept title to the property in question, on or before the completion of the remedial action. The Texas Water Commission signed the Superfund State Contract (SSC) on February 26, 1992. The SSC represents the State's assurance that it will accept title to the property. The EPA has designated the COE through an Interagency Agreement that was approved May 13, 1991, to implement the relocation of the residents residing in the Carver Terrace Community and the purchase of this real estate. The COE will be the lead Agency for this portion of the project, and EPA will be the supporting Agency. Once the acquisition process is initiated, EPA will resume the lead on activities associated with the remediation of this Superfund site. Such activities will include: negotiating with the responsible party(s) to reimburse the Fund for the buyout; resuming negotiations to allow the responsible party(s) to finance the remediation of soil and ground water contamination; coordinating with various State and government agencies to insure that their concerns associated with this site are addressed consistent with the NCP; developing and finalizing plans that will be used to implement the 1988 ROD as amended; and, remediating the site. These activities will be performed during the same time frame that the COE executes the acquisition process.

The COE projects that it will take 9 to 10 months to acquire the property. In some instances, similar actions have taken as long as two years. EPA's time frame associated with the RD/RA negotiation period may range from 90 to 150 days, achieving approved work plans may take 6 to 10 months, and remediation of contaminated soil may take 18 months to 3 years. The period of time required to complete ground water remediation has not been determined. However, the ground water and Wagner Creek monitoring program will continue for at least 30 years, unless it can be shown during the remedial action that a shorter length of time is appropriate.

Until the purchases of the homes are completed, the implementation of

the Remedial Action cannot be initiated. During the period that the COE coordinates and implements the measures necessary to purchase the homes, EPA will be negotiating and finalizing activities associated with the final remediation for the site with the responsible party(s). Health and Safety Plans, the Remedial Design, the air monitoring program, etc. for the site can be developed while the buyout is being conducted. Moreover, EPA expects the ground water remediation measures to proceed concurrently with response activities associated with operable unit 2.

The RD/RA will be addressed in three operable units. The first operable unit will involve purchasing the homes and providing relocation assistance. The second operable unit will involve the destruction, removal and disposal of the structures and debris in the appropriate facility, excavation and treatment of contaminated soils, and replacement of the excavated areas with clean fill. The third operable unit will involve the treatment of the contaminated ground water. The remediated area will be limited to non-residential use through deed restrictions and zoning changes. Also, the remediated area will be fenced and allowed to return to its natural state until such time that the State of Texas and/or the City of Texarkana plan to utilize the property consistent with land use limitation called for in this ROD amendment. Operable units 2 and 3 will be performed simultaneously, and initiated at the completion of operable unit 1.

VII. SITE RISKS

The intent of this assessment is to provide a discussion and basis for the succession of risk evaluations that were performed for the Koppers Superfund site. Specifically, this assessment will explain how the 1990 revised action level for contaminated soil on the residential portion of the site was derived, and, given the fact that a buyout will be performed, confirm that the 1988 action level of 100 ppm carcinogenic PAH is protective of human health for non-residential use, and the environment.

In 1985, a RI was conducted at the Carver Terrace subdivision. The results of samples collected from yards showed the highest concentrations of PAHs existed in soils located in the former operation and drip track areas of the old wood preserving facility. This included the yards on the south side of West Third Street, several lots along Travis Street, and several lots bordered by Fannin Street and Nettie Street which remain undeveloped. To reduce the short term exposure created by these contaminants, protective soil/sod barriers were installed in those areas that had elevated levels of surface contamination. Approximately 24 residential lots required a protective soil/sod barrier. Sampling results also indicated that lower concentrations were more widespread across the site. This is possibly due to the grading conducted on the residential portion during the development of the subdivision.

1988 Baseline Risk Assessment

A Baseline Risk Assessment was conducted on the Koppers Texarkana site utilizing data gathered from the RI. In the 1988 Koppers assessment, PAHs were determined to be the class of chemicals of concern for the site. In general, PAHs consist of a number of chemicals, of which the carcinogenic PAHs represent a class of seven chemicals. At present, benzo(a)pyrene is the only chemical of the seven chemicals that has an interim cancer potency factor and was therefore used as a representative of carcinogenicity of this group of PAH chemicals, to determine the risk posed by the contaminated soils, as well as the action level for remediating the site. Upon reviewing the RI data, benzo(a)pyrene toxicity value was used to represent carcinogenic PAHs as a class of chemicals, and was used as the basis for the 1988 risk assessment for the site (Figure 2).

The 1988 assessment determined that an action level for the entire site of 100 ppm total carcinogenic PAH for soil exposure had an additional cancer risk of 3×10^{-5} (Table 1), assuming no relocation of residents (i.e. residential use). The risk of cancer 3×10^{-5} means that three additional people in their lifetime (70 years), out of one hundred thousand residents living on the remedied area will have a statistical chance of developing cancer from the site. By comparison, the national risk of developing cancer over a 70 year life span is estimated at 2×10^{-1} , or one chance in five. It is EPA's policy to evaluate remedial options that will result in remedying Superfund sites so that the risk from developing cancer is between one in ten thousand (1×10^{-4}) to one in one million (1×10^{-6}).

The action level established for this site was in compliance with the risk assessment guidelines in effect at the time the RI was conducted. However, in reevaluating the action level of 100 ppm total carcinogenic PAHs for soil on the residential portion, the Agency determined that the exposure assumptions used to derive this action level were not reflective of a residential subdivision that is occupied by residents on a continuous basis, and therefore needed further refinement. For this reason and the fact that the 1988 action level would not provide adequate protection for residential use (1.5×10^{-3} , Table 2), EPA revised the action level for the residential portion of the site to be consistent with the present residential use. New guidance was also a factor in reevaluating the 1988 action level, as well as EPA's desire to further protect the residents at the Koppers' site.

1990 Revised Action Level for Residential Use

In calculating both the original and revised action level, benzo(a)pyrene was used as the representative carcinogenic PAH because it is one of the most toxic compared to the other carcinogenic PAHs. The exposure scenario used was based on residential use for present and future land use. The revised remediation goal considered the

KOPPERS SUPERFUND SITE

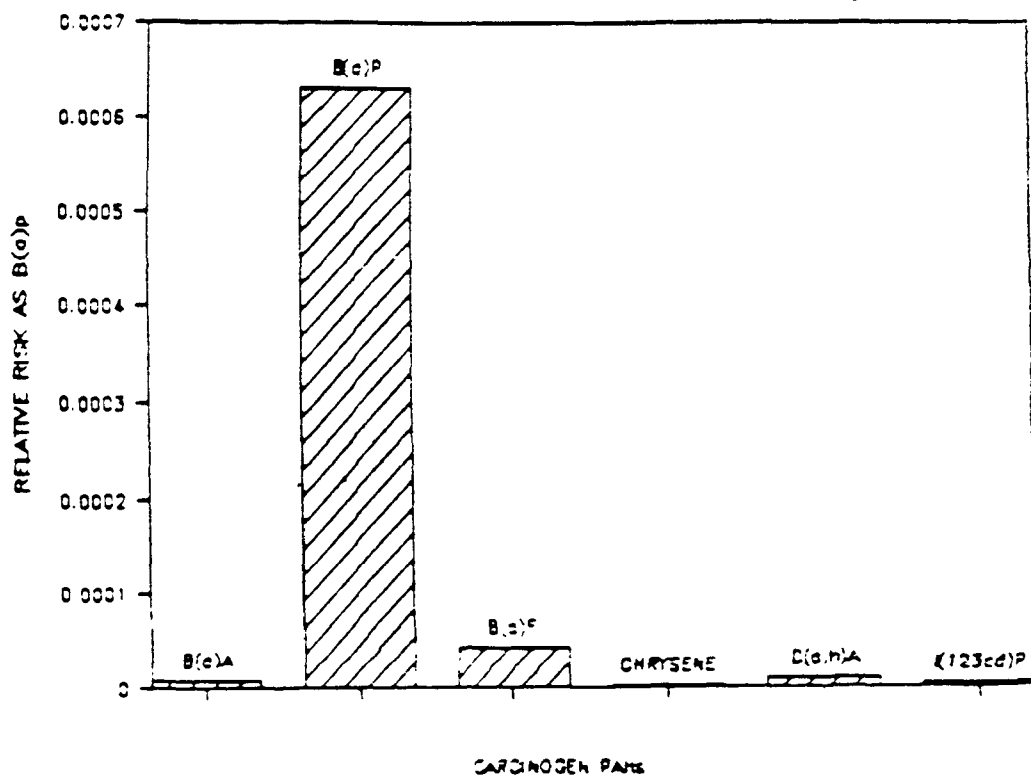


Figure 2 Carcinogenic PAHs
1988 Baseline Risk Assessment

TABLE 1

1988 Potential Risks for Carver Terrace Soils if^(a)
 Site is Remediated to 100 ppm Carcinogenic PAHs
 (Assumes Residential Usage)

Contaminant	Maximum Concentration (mg/kg soil)	Total Lifetime Intake (mg/kg/day)	Hazard Index	Excess Maximum Lifetime Cancer Risk
Carcinogenic PAHs ^(b)	100	2.58E-06		3E-05
PCP	17	6.15E-06	2E-04	
Dioxin Equivalents ^(b)	0.0000077	6.59E-13		1E-07
Arsenic	3.3	1.57E-06		2E-06
Chromium	18	5.98E-06	1E-03	
Copper	27	8.99E-06	2E-04	
Lead	106	3.51E-05	3E-02	
Mercury	0.355	1.18E-07	8E-05	
Zinc	552	1.84E-04	9E-04	
			3E-02	3E-05

Contaminant	Average Concentration (mg/kg soil)	Total Lifetime Intake (mg/kg/day)	Hazard Index	Excess Average Lifetime Cancer Risk
Carcinogenic PAHs ^(b)	7.8	2.01E-07		2E-06
PCP	1.35	5.21E-07	2E-05	
Dioxin Equivalents ^(b)	0.0000077	6.59E-13		1E-07
Arsenic	2.7	1.29E-06		2E-06
Chromium	3.9	2.70E-06	5E-04	
Copper	2.6	3.24E-06	9E-05	
Lead	12.9	1.33E-05	1E-02	
Mercury	0.18	5.97E-08	4E-05	
Zinc	3.4	5.37E-05	3E-05	
			1E-02	4E-06

(a) Exposure reflects the scenario in the FS Report called "Future Carver Terrace".

(b) Concentrations reflect present levels; degradation reflected in intake calculations.

TABLE 2

1990 Revised Remediation Goals
Assuming Residential Use

The remediation goal accounts for ingestion of potentially contaminated soils.

$$IF(\text{ingestion}) = \text{Sum} [(SI * EF * ED) / (BW * AT)]$$

$$\text{Intake} = IF * \text{soil conc.}$$

Where: IF(ingestion) = Intake Factor from soil ingestion
 SI = Age-specific Soil Ingestion Rate (RAGS and OSWER Directive 9850.4)
 EF = Exposure Frequency (days/year)
 ED = Age-specific Exposure Duration (years)
 BW = Age-specific Body Weight (Handbook)
 AT = Averaging Time (70 years)
 soil conc. = soil concentration

Age-specific exposure parameters for soil ingestion:

Age Class (years)	Body Weight (kg)	Ingestion Rate (kg/day)	Frequency (days/year)	Duration (years)
0 - 1	10	0	365	1
1 - 6	17	0.0002	365	5
6 - 12	30	0.0001	365	6
12 - 18	55	0.0001	104	6
18 - 70	70	0.0001	52	52

$$IF(\text{ingestion}) = \text{Sum} [(SI * EF * ED) / (BW * AT)]$$

$$= 1.3 \times 10^{-6} \text{ kg/kg-day}$$

$$\text{Intake} = 1.3 \times 10^{-6} \text{ kg/kg-day} * \text{soil conc. mg/kg}$$

$$\text{Risk} = IF(\text{ingestion}) * \text{oral slope factor for b(a)p} * \text{soil conc.}$$

$$\text{Risk} = 1.3 \times 10^{-6} \text{ kg/kg-day} * 11.5/\text{mg/kg-day} * \text{soil conc. mg/kg}$$

$$\text{Risk} = 1.5 \times 10^{-5} \text{ kg/mg} * \text{soil conc. mg/kg}$$

TABLE 2 - Continued

Soil conc. or Remediation Goal at 10^{-6} Target Risk Level is:

$$1 \times 10^{-6} = 1.5 \times 10^{-5} \text{ kg/mg} * \text{soil conc. mg/kg}$$

Soil Conc.

or

$$\text{Remediation Goal} = 1 \times 10^{-6} / 1.5 \times 10^{-5}$$

$$= 0.07 \text{ mg/kg}$$

Risk at a soil concentration of 100 mg/kg is:

$$\text{Risk} = 1.5 \times 10^{-5} \text{ kg/mg} * 100 \text{ mg/kg}$$

$$= 1.5 \times 10^{-3}$$

The 1×10^{-6} , 1×10^{-5} , 1×10^{-4} target remediation goals are 0.07, 0.7, and 7 mg/kg benzo(a)pyrene equivalents, respectively. These target remediation goals are below or close to the contract-required quantitation limit for benzo(a)pyrene of 0.33 mg/kg. A remediation goal of 0.33 mg/kg benzo(a)pyrene equivalents would approach an upper bound excess lifetime cancer risk of five in one million (5×10^{-6}) and be within EPA's acceptable risk range.

protection of individuals living at the site for their entire lifetime (70 years), including childhood exposure. The remediation goal also assumed no degradation of the carcinogenic PAHs in the soils, and a gastrointestinal absorption factor of 1, accounted for ingestion of potentially contaminated soils.

Remediation goal development used the Risk Assessment Guidance for Superfund, Human Health Manual, Volume 1, Part A (RAGS - EPA/540/1-89/002, December 1989) and the Exposure Factors Handbook (EPA/600/8-89/043, March 1990). The interim oral slope factor for benzo(a)pyrene is used as the representative carcinogenic PAH. The oral slope factor for benzo(a)pyrene is under review by the Carcinogen Risk Assessment Verification Endeavor (CRAVE) work group.

With the parameters established, the soil samples (0 to 2 feet) taken from the residential portion were reevaluated to determine the specific concentrations of all of the carcinogenic PAHs. Each compound was given a toxicity rating expressed as an "equivalent amount of benzo(a)pyrene". Adding the toxicities of each of the compounds produced the sample's overall toxic equivalency to benzo(a)pyrene. Adding the different PAH compounds in this manner allowed EPA to characterize the possible risk posed by the site as if it contained a single "equivalent" compound and, more importantly, to establish a single remediation goal that encompassed a wide variety of PAH compounds. The revised action level selected to remediate the residential portion was 0.33 ppm benzo(a)pyrene equivalent which is the contract-required quantitation limit (Table 2). This revised action level further reduces the likelihood of developing cancer, and provides an upper bound additional lifetime cancer risk of five in one million (5×10^{-6}).

Depth Criteria and Increased Volume Associated with the 1990 Revised Action Level

The 1990 revised action level for the residential portion affected the initial projections made for the volume of soil requiring excavation, the cost, and the time needed to conduct the excavation activities. Unlike the one foot depth criterion established by the 1988 ROD, the depth of excavation was to be governed by the results obtained from the pre-excavation sampling exercise, and the possible interference encountered from the shallow ground water aquifer. Technical consideration would determine what method (ground water treatment or excavation) to use to retrieve contaminated soils below a depth of three feet. The existing data collected from yards where access was granted was extrapolated to also project the quantity of contaminated soil that possibly existed in yards that did not grant access. The volume of soil targeted for excavation was approximately 23,765 cubic yards. The cost associated with excavating and treating contaminated soil was estimated to cost \$1.173 million, and approximately 15 to 27 months would be required to complete the tasks associated with this activity.

Reevaluation of the Action Level

Implementation of the 1990 revised action level for the residential portion of the site was suspended, based on the Conference Committee Report on the FY91 Appropriations Bill, that contained language calling for the buyout of homes on the Koppers Texarkana site and the provision of relocation assistance to the residents. With approval of this Bill, EPA redirected its effort to amend the 1988 ROD to: include a property buyout, discuss the reclassification of the residential portion of the site to non-residential use, and confirm the 1988 action level of 100 ppm carcinogenic PAHs is protective and appropriate to remediate the area for non-residential use.

1988 and 1991 Risk Evaluations

Once the buyout is completed, institutional controls will be put in place to prevent this property from being utilized for residential use. The risk from 100 ppm carcinogenic PAHs falls within the 10^{-4} to 10^{-6} acceptable risk range given an industrial scenario only and not for residential use. Though the area exists in a 100 year flood plain, it can be used to facilitate proper drainage for the surrounding area, and/or for industrial purposes, if flood protection is provided. The risk from 100 ppm carcinogenic PAH does not fall within the 10^{-4} to 10^{-6} risk range for residential land use.

To ensure adequate protection of human health and the environment, EPA reevaluated the risk posed by the site to determine if the 1988 action level of 100 ppm total carcinogenic PAHs is appropriate given the changes in classification and utilization of the property from residential to non-residential use and industrial scenario respectively.

In reevaluating the method used to derive the 1988 action level, a comparison was performed between the guidance used in 1988, to current guidance. The 1988 baseline risk from benzo(a)pyrene if no remediation is performed is estimated to be 6×10^{-4} (Table 3). However, when this risk was reevaluated using new guidance, it was estimated to be 1.04×10^{-3} (Table 4). It was observed in the 1988 assessment that indicator chemicals or those chemicals which pose the greatest potential public health risk were used as recommended by the old Superfund Public Health Evaluation Manual (SPHEM - EPA 1986). As discussed in the Risk Assessment Guidance for Superfund, Human Health Manual, Volume 1, Part A (RAGS -EPA/540/1-89/002, December 1989) which replaces SPHEM, the new procedure requires the inclusion of all chemicals of potential concern, and the exclusion of those chemicals evaluated to be of no concern. A final list of chemicals is then prepared for the quantitative risk assessment. The 1991 evaluation used the interim oral slope factor for benzo(a)pyrene as the representative carcinogenic PAH. The oral slope factor for benzo(a)pyrene is under review by the Carcinogen Risk Assessment Verification Endeavor (CRAVE) work group. Differing from the 1988 approach, biodegradation or the natural biological breakdown of the

TABLE 3

1988 Potential Risks for Carver Terrace Soils if^(a)
No Action Performed at the Site

Contaminant	Maximum Concentration (mg/kg soil)	Total Lifetime Intake (mg/kg/day)	Hazard Index	Excess Maximum Lifetime Cancer Risk
Carcinogenic PAHs ^(b)	2021	5.21E-05		6E-04
PCP	17	6.15E-06	2E-04	
Dioxin Equivalents ^(b)	0.000767	6.55E-11		1E-05
Arsenic	53.35	1.77E-05		3E-05
Chromium	57.5	1.91E-05	4E-03	
Copper	101	3.35E-05	9E-04	
Lead	298	9.88E-05	7E-02	
Mercury	0.355	1.18E-07	8E-05	
Zinc	3370	1.12E-03	5E-03	
			8E-02	6E-04

Contaminant	Average Concentration (mg/kg soil)	Total Lifetime Intake (mg/kg/day)	Hazard Index	Excess Average Lifetime Cancer Risk
Carcinogenic PAHs ^(b)	49.7	1.28E-06		1E-05
PCP	1.35	5.21E-07	2E-05	
Dioxin Equivalents ^(b)	0.0000077	6.59E-13		1E-07
Arsenic	2.77	1.32E-06		2E-06
Chromium	3.94	2.70E-06	5E-04	
Copper	2.57	3.24E-06	9E-05	
Lead	13.54	1.40E-05	1E-02	
Mercury	0.18	5.97E-08	4E-05	
Zinc	29.9	4.72E-05	2E-04	
			1E-02	2E-05

^(a) Exposure reflects the scenario in the FS Report called "Future Carver Terrace".

^(b) Concentrations reflect present levels; degradation reflected in intake calculations.

TABLE 4

1991 Evaluation of the 100 ppm Action Level for Industrial Use

ARITHMETIC AVERAGE	REASONABLE MAXIMUM CONCENT. (mg/kg)	CHRONIC DAILY INTAKE (mg/kg/d)	B(A)P POTENCY FACTOR (mg/kg/d)	RISK USING B(a)P POTENCY FACTOR	RELATIVE POTENCY TO B(a)P CHU/CHEN*	RISK USING RELATIVE POTENCY TO B(a)P
B(a)A	55.97	9.26E-05	11.5	1.06E-03	0.0134	1.43E-05
B(a)P	48.72	8.26E-05	11.5	9.50E-04	1.0	9.50E-04
B(b)F	56.33	7.86E-05	11.5	9.04E-04	0.08	7.23E-05
CHRYSENE	114.73	1.59E-04	11.5	1.83E-03	0.0012	2.20E-06
D(a,h)A	1.22	2.00E-07	11.5	2.30E-06	0.69	1.58E-06
I(123cd)P	15.53	1.27E-05	11.5	1.46E-04	0.0171	2.49E-06
TOTAL		4.26E-04		4.90E-03		1.04E-03

B(a)A = Benzo(a)anthracene
 B(a)P = Benzo(a)pyrene
 B(b)F = Benzo(b)fluoranthene
 D(a,h)A = Dibenzo(a,h)anthracene
 I(1,2,3-c,d)P = Indeno(1,2,3-c,d)pyrene

RISK CONSIDERING ALL CARCINOGEN PAHS HAVE A POTENCY FACTOR EQUIVALENT TO BENZO(a)PYRENE:

$$4.26E-04 \times 11.5 = 4.9E-03$$

RATIO OF RISK AS B(a)P USING RELATIVE POTENCY TO RISK USING POTENCY FACTOR EQUIVALENT TO B(a)P:

$$1.04E-03 + 4.9E-03 = 0.21 \text{ OR } 21\%$$

THE ADJUSTED PAHS CANCER RISK ASSOCIATED WITH A TOTAL CARCINOGEN PAHS OF 100 MG/KG CLEAN UP LEVEL FOR THE KOPPERS SUPERFUND SITE IS:

$$2.0E-04 \times 0.21 = 4.2E-05$$

* Chu MML, Chen CW. 1984. Evaluation and estimation of potential carcinogenic risks of polycyclic aromatic hydrocarbons (PAHs). Paper presented at the Symposium on PAHs in the Workplace. Sponsor: International Chemical Congress of Pacific Basin Societies.

PAHs was not included in the 1991 evaluation since a conservative approach was desired. In establishing the parameters for the 1991 evaluation, 25 years instead of 40 years exposure duration and an inhalation rate of 20 m³/day instead of 15 m³/day were used in accordance with the updated guidance on Standardized Exposure Parameters (Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, "Standard Default Exposure Factors", OSWER Directive 9285.6-03, March 25, 1991). It was noted during the review of the 1988 risk assessment that 5 years was used as the exposure duration for workers. According to current standards (OSWER Directive 9285.6-03), an individual is assumed to work 25 years at the same location (95th percentile; Bureau of Labor Statistics, 1990). A gastrointestinal absorption factor of 1, accounted for ingestion of potentially contaminated soils in the 1991 evaluation for a commercial/industrial exposure scenario. Inhalation and ingestion potency factors for benzo(a)pyrene as cited by the Health Effect Assessment for PAHs (September 1984) are 6.11 (mg/kg/day)⁻¹ and 11.53 (mg/kg/day)⁻¹ respectively. The reduced default equation for carcinogenic effects was used to determine the risk at 100 ppm total carcinogenic PAH chemical concentration in soil assuming commercial/industrial land use (see Exhibit 1 and 2). The risk associated with the action level of 100 ppm total carcinogenic PAHs assuming industrial use, was found to be 2.0×10^{-4} using toxicity values for benzo(a)pyrene (see Table 5). This risk falls above the acceptable risk range discussed in the National Contingency Plan.

With the parameters established, the samples (0 to 2 feet) taken from the residential portion were reevaluated to determine the specific concentrations of all of the carcinogenic compounds in PAHs found at the site. Each compound was given a toxicity rating expressed as an "equivalent amount of benzo(a)pyrene". Adding the toxicities of each of the compounds produced the sample's overall toxic equivalency to benzo(a)pyrene as opposed to the 1988 approach which treated all of the compounds as being as potent as benzo(a)pyrene. Summing the different compounds in this manner allowed EPA to characterize the possible risk posed by the site as if it contained a single "equivalent" compound and, more importantly, it established a single remediation goal that encompassed a wide variety of PAH compounds. A site specific risk assessment associated with the PAHs was also performed. The risk was adjusted by using carcinogenic relative potencies. The adjusted risk was found to be 22% of the risk calculated by using the potency factor of benzo(a)pyrene for all carcinogenic PAHs. The cancer risk associated with the 100 ppm carcinogenic PAHs soil action level at Koppers superfund site was calculated with these adjustments, and the risk was found to be $4.0E-5$ (Table 4). The site specific risk is well within the EPA's acceptable risk range assuming an industrial/commercial scenario.

Exhibit 1

COMMERCIAL/INDUSTRIAL SOIL - CARCINOGENIC EFFECTS

$$TR = \frac{SF_o \times C \times 10^{-6} \text{ kg/mg} \times EF \times ED \times IR_{soil}}{BW \times AT \times 365 \text{ days/yr}} + \frac{SF_i \times C \times EF \times ED \times IR_{air} \times (1/VF + 1/PEF)}{BW \times AT \times 365 \text{ days/yr}}$$

$$C \text{ (mg/kg; risk-based)} = \frac{TR \times BW \times AT \times 365 \text{ days/yr}}{EF \times ED \times [(SF_o \times 10^{-6} \text{ kg/mg} \times IR_{soil}) + (SF_i \times IR_{air} \times (1/VF + 1/PEF))]} \quad (6)$$

where:

Parameters	Definition (units)	Default Value
C	chemical concentration in soil (mg/kg)	—
TR	target excess individual lifetime cancer risk (unitless)	10^{-6}
SF_i	inhalation cancer slope factor ((mg/kg-day) ⁻¹)	chemical-specific
SF_o	oral cancer slope factor ((mg/kg-day) ⁻¹)	chemical-specific
BW	adult body weight (kg)	70 kg
AT	averaging time (yr)	70 yr
EF	exposure frequency (days/yr)	250 days/yr
ED	exposure duration (yr)	25 yr
IR_{soil}	soil ingestion rate (mg/day)	50 mg/day
IR_{air}	workday inhalation rate (m ³ /day)	20 m ³ /day
VF	soil-to-air volatilization factor (m ³ /kg)	chemical-specific (see Section 3.3.1)
PEF	particulate emission factor (m ³ /kg)	4.63×10^9 m ³ /kg (see Section 3.3.2)

$$C_{sat} = (K_{oc} \times s \times n_m) + (s \times \theta_m) \quad (6a)$$

where:

Parameters	Definition (units)	Default Value
C_{sat}	soil saturation concentration (mg/kg)	—
K_{oc}	soil-water partition coefficient (L/kg)	chemical-specific, or $K_{oc} \times OC$
K_{oc}	organic carbon partition coefficient (L/kg)	chemical-specific
OC	organic carbon content of soil (fraction)	site-specific, or 0.02
s	solubility (mg/L-water)	chemical-specific
n_m	soil moisture content, expressed as a weight fraction	site-specific
θ_m	soil moisture content, expressed as L-water/kg-soil	site-specific

REDUCED EQUATION: COMMERCIAL/INDUSTRIAL SOIL - CARCINOGENIC EFFECTS

$$\text{Risk-based PRG (mg/kg; } TR = 10^{-6}) = \frac{2.9 \times 10^{-4}}{[(5 \times 10^{-5}) \times SF_o] + [SF_i \times ((20/VF) + (4.3 \times 10^{-6}))]} \quad (6')$$

where:

SF_o	= oral slope factor in (mg/kg-day) ⁻¹
SF_i	= inhalation slope factor in (mg/kg-day) ⁻¹
VF	= chemical-specific soil-to-air volatilization factor in m ³ /kg (see Section 3.3.1)

If $PRG > C_{sat}$, then set $PRG = C_{sat}$ (where C_{sat} = soil saturation concentration (mg/kg); see Equation (6a) and Section 3.3.1).

Exhibits 1 and 2 may be found in "Risk Assessment Guidance for Superfund, Human Health Evaluation Manual--Part B, Development of Risk-based Remedial Goals" (OSWER Directive 9285.01B).

SOIL-TO-AIR VOLATILIZATION FACTOR

$$VF (m^3/kg) = \frac{(LS \times V \times DH)}{A} \times \frac{(314 \times q \times T)^{1/2}}{(2 \times D_e \times E \times K_{ow} \times 10^{-3} \text{ kg/g})} \quad (8)$$

where:

$$z (cm^2/s) = \frac{(D_e \times E)}{E + (p_s)(1-E)K_{ow}}$$

Standard default parameter values that can be used to reduce Equation (8) are listed below. These represent "typical" values as identified in a number of sources. For example, when site-specific values are not available, the length of a side of the contaminated area (LS) is assumed to be 45 m; this is based on a contaminated area of 0.5 acre which approximates the size of an average residential lot. The "typical" values LS, DH, and V are from EPA 1986. "Typical" values for E, OC, and p_s are from EPA 1984, EPA 1988b, and EPA 1988f. Site-specific data should be substituted for the default values listed below wherever possible. Standard values for chemical-specific D_e , H, and K_{ow} can be obtained by calling the Superfund Health Risk Technical Support Center.

Parameter	Definition (units)	Default
VF	volatilization factor (m^3/kg)	—
LS	length of side of contaminated area (m)	45 m
V	wind speed in mixing zone (m/s)	2.25 m/s
DH	diffusion height (m)	2 m
A	area of contamination (cm^2)	20,250,000 cm^2
D_e	effective diffusivity (cm^2/s)	$D_e \times E^{0.5}$
E	true soil porosity (unitless)	0.35
K_{ow}	soil/air partition coefficient (g soil/ cm^3 air)	$(H/K_a) \times 41$, where 41 is a units conversion factor
p_s	true soil density or particulate density (g/ cm^3)	2.65 g/ cm^3
T	exposure interval (s)	7.9×10^6 s
D_e	molecular diffusivity (cm^2/s)	chemical-specific
H	Henry's law constant (atm- m^3/mol)	chemical-specific
K_a	soil-water partition coefficient (cm^3/g)	chemical-specific, or $K_{ow} \times OC$
K_{ow}	organic carbon partition coefficient (cm^3/g)	chemical-specific
OC	organic carbon content of soil (fraction)	site-specific, or 0.02

PARTICULATE EMISSION FACTOR

$$PEF (m^3/kg) = \frac{LS \times V \times DH \times 3600 \text{ s/hr}}{A} \times \frac{1000 \text{ g/kg}}{0.036 \times (1-G) \times (U_m/U_t)^2 \times F(x)} \quad (9)$$

where:

Parameter	Definition (units)	Default
PEF	particulate emission factor (m^3/kg)	$4.63 \times 10^9 \text{ m}^3/kg$
LS	width of contaminated area (m)	45 m
V	wind speed in mixing zone (m/s)	2.25 m/s
DH	diffusion height (m)	2 m
A	area of contamination (m^2)	2025 m^2
0.036	respirable fraction (g/ m^3 -hr)	0.036 g/ m^3 -hr
G	fraction of vegetative cover (unitless)	0
U_m	mean annual wind speed (m/s)	4.5 m/s
U_t	equivalent threshold value of wind speed at 10 m (m/s)	12.8 m/s
F(x)	function dependent on U_m/U_t (unitless)	0.0497 (determined using Cowherd 1985)

TABLE 5
1991 Risk at 100 ppm Carcinogenic PAH
Chemical Concentration in Soil

Equations used:

Risk at Chemical concentration = (see Exhibit 1)
in soil

Volatilization factor VF = (see Exhibit 2)

Soil water partition
coefficient (Kd) = Organic carbon partition coefficient (Koc)
X Organic Carbon Soil Content (2%).

$$Kd = Koc \times OC = 5.5 \times 10^6 \times 0.02 = 110,000$$

$$\text{Henry's Law Constant} = 1.55 \times 10^{-6}$$

$$\text{Benzo(a)pyrene} = C_{20}H_{12}$$

$$\text{Molecular Diffusivity } (D_1) = \frac{0.001T^{1.75} \times (1/M_1 + 1/M_2)^{0.5}}{P[(V_1)^{1/3} + (V_2)^{1/3}]^2}$$

at 25°C

where : T = absolute temperature (K)

M₁ & M₂ = molecular weights of components 1 and 2 (g/mole)

V₁ & V₂ = atomic diffusion volume of components 1 and 2
(cm³/mole).

P = absolute pressure, atm.

$$VF = \frac{17.42 \times (0.044)^{0.5} \times 110000}{[0.35 + (0.042 \times 110000)/1.55 \times 10^{-6}]^{0.5} \times 0.044 \times 1.55 \times 10^{-6}}$$

$$VF = 1.08 \times 10^6$$

$$\text{Risk at Chemical Concentration in Soil} = \frac{100 \times 250 \times 25 \times [(11.5 \times 10^{-6} \times 50) + (6.11 \times 10^{-6} \times 1/108000000 + 1/463000000)]}{70 \times 70 \times 365}$$

$$\text{Risk at Chemical concentration in Soil} = 2.0 \times 10^{-4}$$

For a 10⁻⁶ cancer risk the clean up level is 0.5 mg/kg

For a 10⁻⁴ cancer risk the clean up level is 50 mg/kg

Governing Action Level for the Koppers' Site

The 1988 action level of 100 ppm total carcinogenic PAHs will continue to be utilized for the planned remediation of the Koppers Texarkana Superfund site because it provides an acceptable level of protection for industrial scenario, and is protective of human health and the environment. To determine conformance with this action level, the concentrations for carcinogenic PAHs shall be summed and this total compared to 100 ppm. Measured concentrations of the various carcinogenic PAHs will be used rather than equivalent benzo(a)pyrene concentrations.

VIII. 1992 INCLUSIVE AMENDED REMEDY

This amendment does not change the basic approach for the remediation of site contaminants as set out in the ROD signed on September 23, 1988. The remedy calls for an action level for removing greater than 100 ppm total carcinogenic PAHs in the soil collected to a depth of one foot, treatment of contaminated soils, and remediation of contaminated ground water in the upper aquifer (Stratum I). The contaminated groundwater will be treated to levels equal to BAT Requirements for the Organic Chemical, Plastics, and Synthetic Fibers Industry. Ground water cleaned to BAT will be reinjected into the aquifer along with surfactants to help recover the non-aqueous phase liquids (NAPLs). Ground water collection will continue until the NAPLs have been recovered to the maximum extent possible. This level will be determined during the remedial design based upon pilot testing of the collection and treatment system. After this point is reached, the ground water collection will cease and the ground water will be allowed to naturally attenuate to background levels. A sampling program will monitor the effectiveness of the selected remedy and provide data necessary to trigger future corrective action, if necessary. Based on information contained in the RI/FS, an estimated 19,400 cubic yards of soil and 45 million gallons of groundwater will require treatment. The technology that will be utilized consists of mechanical soil washing, and oil/water separation and either carbon adsorption or fluidized carbon bed treatment of contaminated groundwater.

The amendment to the 1988 ROD will include: 1) a buyout of the Carver Terrace Community, relocation assistance to the residents, and the demolition of the homes and the removal and disposal of debris in the appropriate facility, and 2) reclassification of the property from residential to non-residential use, and affirmation that the 100 ppm carcinogenic PAHs action level is still appropriate to remediate the site, given the changed land use. EPA will work with the State of Texas and the City of Texarkana to have this property reclassified.

The RD/RA will be addressed in three operable units. The first operable unit will involve purchase of the homes and providing

relocation assistance. The second operable unit will involve destruction, removal and disposal of the structures and debris to the appropriate facility, excavation and treatment of contaminated soils, and replacement of the excavated areas with clean fill. The third operable unit will be the treatment of contaminated ground water. The remediated area will be fenced and allowed to return to its natural state until such time that the State of Texas and/or the City of Texarkana plan to utilize the property consistent with the land use limitations called for in this ROD amendment.

The projected cost to implement this amended remedy is \$12.4 million.

ATTACHMENT 1 - COST EVALUATION OF THE SELECTED REMEDY

TABLE A-1
BASELINE CAPITAL COSTS
EXCAVATION/SOIL WASHING *

COST COMPONENT	QUANTITY	UNIT	UNIT COST	TOTAL COST	COMMENTS
SITE PREPARATION	4.4	ACRES	\$1,450	\$6,380	
INITIAL MONITORING					
SAMPLING	22	DAYS	\$400	\$8,800	8 SAMPLES COLLECTED/DAY
ANALYSIS	176	SAMPLES	\$315	\$55,440	8 SAMPLES/LOT ANALYZED
SOILS FROM THE CARVER TERRACE SUBDIVISION:					
EXCAVATION	8400	CY	\$15	\$126,000	1 FT DEPTH OVER 190,000 SF; 20% BULKING
ON-SITE HAULING	8400	CY	\$3	\$25,200	
BULK SOLIDS FROM THE KENNEDY SAND AND GRAVEL PROPERTY:					
LOAD	160	CY	\$100	\$16,000	FOUR 40-CY ROLL-OFFS
ON-SITE HAULING	160	CY	\$3	\$480	
SOIL WASHING TREATMENT SYSTEM:					
TREATMENT SYSTEM MOB/DEMOS	1	LP SUM	\$14,000	\$14,000	
TREATMENT EQUIP. RENTAL (TREATED AT A RATE OF 2.5 TONS PER HOUR @ 10 HOURS PER DAY)	12	MONTHS	\$58,000	\$696,000	INCLUDES REACTORS, TANKS, MIXERS, HOPPER
CHEMICALS	1	LP SUM	\$18,000	\$18,000	
UTILITIES	1	LP SUM	\$11,000	\$11,000	
WASH WATER TREATMENT	1	LP SUM	\$6,750	\$6,750	
OPERATION & SUPERVISION	1	LP SUM	\$165,000	\$165,000	
AIR MONITORING	12	MONTHS	\$3,000	\$36,000	
BACKFILLING OF TREATED SOILS	8560	CY	\$3.00	\$25,680	CARVER TERRACE SOILS AND BULK SOLIDS; PLACED WITHIN THE KS&G PROPERTY
SITE RESTORATION:					
CLEAN BACKFILL-(10")	7000	CY	\$5.00	\$35,000	ONLY FOR CARVER TERRACE AREA
SPREADING	7000	CY	\$2.00	\$14,000	
SOD (2")	21100	SY	\$3.55	\$74,905	ONLY FOR CARVER TERRACE AREA
HEALTH & SAFETY	52	WEEKS	\$4,000	\$208,000	H&S DURING INITIAL MONITOR- ING AND EXCAVATION/TREATMENT
DIRECT CAPITAL COST				\$1,542,635	
ENGINEERING & DESIGN (11%)				\$169,690	
CONTINGENCY (20%)				\$308,527	
TOTAL CAPITAL COST				\$2,020,852	
APPROXIMATE TOTAL CAPITAL COST				\$2,021,000	

(CCCSL-4A)

* An action level of 100 ppm total carcinogenic PAHs was used in deriving the cost.

TABLE A-2
BASELINE CAPITAL COSTS
EXCAVATION/SOIL WASHING
.33ppm Bap EQUIVALENCY CLEAN-UP CRITERIA

COST COMPONENT	QUANTITY	UNIT	UNIT COST	TOTAL COST
SITE PREPARATION	11.77	ACRES	\$1,450	\$17,067
INITIAL MONITORING				
SAMPLING	59	DAYS	\$400	\$23,600
ANALYSIS	470	SAMPLES	\$315	\$148,050
SOILS FROM THE CARVER TERRACE SUBDIVISION				
EXCAVATION & ON-SITE HAUL	28518	CY	\$6 *	\$171,108
BULK SOILS FROM THE KENNEDY SAND AND GRAVEL PROPERTY:				
LOAD	160	CY	\$100	\$16,000
ON-SITE HAULING	160	CY	\$6	\$960
SOIL WASHING TREATMENT SYSTEM				
TREATMENT SYSTEM MOB/DEMOS	1	LP SUM	\$23,327	\$23,327
TREATMENT EQUIPMENT RENTAL	15	MONTHS	\$76,700	\$1,150,500
CHEMICALS	1	LP SUM	\$30,000	\$30,000
UTILITIES	1	LP SUM	\$18,328	\$18,328
WASH WATER TREATMENT	1	LP SUM	\$11,267	\$11,267
OPERATION AND SUPERVISION	1	LP SUM	\$274,927	\$274,927
AIR MONITORING	15	MONTHS	\$3,967	\$59,505
BACKFILLING OF TREATED SOILS	10736	CY	\$6	\$64,416
SITE RESTORATION				
CLEAN BACKFILL	23765	CY	\$5	\$118,825
SPREADING	11.77	ACRES	\$750	\$8,828
HYDROMULCH	11.77	ACRES	\$4,356	\$51,270
HEALTH AND SAFETY	68	WEEKS	\$4,000	\$272,000
DIRECT CAPITAL COST				\$2,438,485
ENGINEERING & DESIGN (11%)				\$268,233
CONTINGENCY (20%)				\$487,697
TOTAL CAPITAL COST				\$3,194,416
APPROXIMATE TOTAL CAPITAL COST				\$3,194,000

NOTE: The additional costs attributed to the 1990 revised action level is approximately \$1.173 million.

* EPA used a different cost estimate here than in Table A-1 for this activity. This revised estimate is more accurate.

TABLE A-3
BASELINE CAPITAL COSTS
FLUIDIZED CARBON BED

COST COMPONENT	QUANTITY	UNIT	UNIT COST	TOTAL COST	COMMENTS

SITE PREPARATION	1	LP SUM	\$5,000	\$5,000	
WELL REPLACEMENT	9	WELLS	\$5,000	\$45,000	1 REPLACEMENT PER 30 YEARS
SUBSURFACE DRAIN SYSTEM:					
DRAINS INSTALL	2100	LF	\$50	\$105,000	
FLOATING PUMPS	20	PUMPS	\$3,000	\$60,000	
SUMP INSTALL	20	SUMPS	\$3,000	\$60,000	
PIPING	1	LP SUM	\$8,000	\$8,000	
RECHARGE TRENCHING (IN-SITU SOIL FLUSHING):					
SHALLOW TRENCH INSTALL	1500	LF	\$25.00	\$37,500	BASED UPON A 10,000 GPD INJECTION RATE
INJECTION PUMPS	2	PUMPS	\$3,500	\$7,000	
PIPING	1	LP SUM	\$35,000	\$35,000	
ELECT & INSTRUM	1	LP SUM	\$20,000	\$20,000	
INJECTION TANK	1	LP	\$10,000	\$10,000	
CHEMICAL FEED SYSTEM	1	LP SUM	\$5,000	\$5,000	
HANDLING OF EXCAVATED SOILS FROM TRENCH EXCAVATION:					
EXCAVATE	2000	CY	\$15	\$30,000	HAULED ON SITE TO GRAVEL PITS; TREATED VIA GR WATER
ON-SITE HAULING	2000	CY	\$3.00	\$6,000	
GROUNDWATER TREATMENT PLANT - PRELIMINARY EARTHWORK:					
SOIL FILL	4000	CY	\$16	\$64,000	
SURVEYING	1	LP SUM	\$5,000	\$5,000	
TREATMENT SYSTEM:					
OFFICE/LAB	1	LP SUM	\$35,000	\$35,000	
OIL/WATER SEP	1	LP SUM	\$16,000	\$16,000	
FLUID BED REACT	1	LP SUM	\$35,000	\$35,000	
PIPING/PUMPS	1	LP SUM	\$65,000	\$65,000	
ELECTR & INSTRUM	1	LP SUM	\$85,000	\$85,000	
ANCIL EQUIPMT	1	LP SUM	\$101,000	\$101,000	
OTHER PROC TANKS	1	LP SUM	\$65,000	\$65,000	
HEALTH & SAFETY	24	WEEKS	\$4,000	\$96,000	H&S OFFICER DURING EXCAVATION; HNU AND RESPIRATORS

DIRECT CAPITAL COST				\$1,000,500 -	

ENGINEERING & DESIGN (11%)				\$110,055	
CONTINGENCY (20%)				\$200,100	
=====					
TOTAL CAPITAL COST				\$1,310,655	

APPROXIMATE TOTAL CAPITAL COST				\$1,311,000	
=====					
(DCC-GW2B)					

(DCC-GW2B)

TABLE A-4
OPERATION AND MAINTENANCE COST ESTIMATE

FLUIDIZED CARBON BED

O&M COMPONENT	ANNUAL COST	COMMENTS
SUBSURFACE DRAINS:		
OPERAT & MAINT	\$15,000	
UTILITIES	\$1,000	
WELL MONITORING:		
SAMPLING & ANALYSIS	\$9,000	9 WELLS, ANNUALLY
RECHARGE TRENCHING (IN-SITU SOIL FLUSHING):		
CHEMICALS	\$70,000	
UTILITIES	\$5,000	
LABOR AND ADMINISTRATION	\$50,000	
FLUIDIZED BED REACTOR SYSTEM:		
UTILITIES	\$20,000	
CHEMICALS	\$15,000	
MAKEUP CARBON	2000	
ANALY PLANT MONITOR	\$12,000	
LABOR & MAINT	\$125,000	
.....
TOTAL ANNUAL O&M COSTS	\$326,000	
(Approximate Value)	\$326,000	FOR YEARS 1 TO 30
.....
(CM-GW2B)		

TABLE A-5
BASELINE CAPITAL COSTS

ACTIVATED CARBON

COST COMPONENT	QUANTITY	UNIT	UNIT COST	TOTAL COST	COMMENTS
SITE PREPARATION	1	LP SUM	\$5,000	\$5,000	
WELL REPLACEMENT	9	WELLS	\$5,000	\$45,000	1 REPLACEMENT PER 30 YEARS
SUBSURFACE DRAIN SYSTEM:					
DRAINS INSTALL	2100	LF	\$50	\$105,000	
PUMPS	20	PUMPS	\$3,000	\$60,000	
SUMP INSTALL	20	SUMPS	\$3,000	\$60,000	
PIPING	1	LP SUM	\$8,000	\$8,000	
RECHARGE TRENCHING (IN-SITU SOIL FLUSHING):					
SHALLOW TRENCH INSTALL	1500	LF	\$25	\$37,500	BASED UPON A 10,000 GAL/DAY INJECTION RATE
INJECTION PUMPS	2	PUMPS	\$3,500	\$7,000	
PIPING	1	LP SUM	\$35,000	\$35,000	
ELECT & INSTRUM	1	LP SUM	\$20,000	\$20,000	
INJECTION TANK	1	LP SUM	\$10,000	\$10,000	
CHEMICAL FEED SYSTEM	1	LP SUM	\$5,000	\$5,000	
HANDLING OF EXCAVATED SOILS FROM TRENCH EXCAVATION:					
EXCAVATE	2000	CY	\$15	\$30,000	HAULED ON SITE TO THE GRAVEL PITS; TREATED VIA GR WATER
ON-SITE HAULING	2000	CY	\$3.00	\$6,000	
GROUNDWATER TREATMENT PLANT - PRELIMINARY EARTHWORK:					
SOIL FILL	4000	CY	\$16	\$64,000	
SURVEYING	1	LP SUM	\$5,000	\$5,000	
TREATMENT SYSTEM:					
OFFICE/LAB	1	LP SUM	\$35,000	\$35,000	
OIL/WATER SEP	1	LP SUM	\$16,000	\$16,000	
CARB ADSORP UNIT	1	LP SUM	\$40,000	\$40,000	
INIT CARB FILL	5000	LBS	\$1	\$5,000	
PIPING/PUMPS	1	LP SUM	\$47,000	\$47,000	
ELECTR & INSTRUM	1	LP SUM	\$85,000	\$85,000	
ANCIL EQUIPMT	1	LP SUM	\$81,000	\$81,000	
OTHER PROC TANKS	1	LP SUM	\$45,000	\$45,000	
HEALTH & SAFETY	24	WEEKS	\$4,000	\$96,000	M&S OFFICER DURING EXCAVATION; MMJ AND RESPIRATORS
DIRECT CAPITAL COST				\$952,500	
ENGINEERING & DESIGN (11%)				\$104,775	
CONTINGENCY (20%)				\$190,500	
TOTAL CAPITAL COST				\$1,247,775	
APPROXIMATE TOTAL CAPITAL COST				\$1,248,000	
COC 0-2A)					

(DEC 5-2A)

TABLE A-6
OPERATION AND MAINTENANCE COST ESTIMATE

ACTIVATED CARBON

O&M COMPONENT	ANNUAL COST	COMMENTS
SUBSURFACE DRAINS:		
OPERAT & MAINT	\$15,000	
UTILITIES	\$1,000	
WELL MONITORING:		
SAMPLING & ANALYSIS	\$9,000	9 WELLS, ANNUALLY
RECHARGE TRENCHING (IN-SITU SOIL FLUSHING):		
CHEMICALS	\$70,000	
UTILITIES	\$5,000	
LABOR AND ADMINISTRATION	\$50,000	
CARBON ADSORPTION UNIT:		
UTILITIES	\$5,000	
CHEMICALS	\$7,000	
ANALY PLANT MONITOR	\$12,000	
VIRGIN CARBON	\$3,000	
CARBON DISPOSAL	\$9,000	
LABOR & MAINT	\$125,000	
.....		
TOTAL ANNUAL O&M COSTS	\$311,000	
(Approximate Value)	\$311,000	FOR YEARS 1 TO 30
.....		
(OM-GW2A)		

TABLE A-7
OPERATION AND MAINTENANCE COST ESTIMATE

O&M COMPONENT	ANNUAL COST	COMMENTS
.....
FENCE:		
PERIODIC INSPECTIONS	\$4,800	4 INSPECTS @ \$1200 EACH
REPAIR	\$400	REPLACE 1% OF FENCE/YEAR
.....		
TOTAL ANNUAL O&M COSTS	\$5,200	
	
(Approximate Value)	\$5,200	FOR YEARS 1 TO 30
.....		
(OM-SL2)		

SUMMARY OF REMEDIAL ACTION ESTIMATED COSTS

ACTIVITY	CAPITAL COST BASELINE
Buyout of the Carver Terrace subdivision	\$ 5,000,000
Demolition of the homes and the removal and disposal of the debris	960,000
Mechanical Soil Washing	2,021,000
Groundwater treatment utilizing fluidized carbon bed	1,311,000
(Groundwater treatment utilizing activated carbon)	(1,248,000)

Estimated Total	\$ 9,292,000 (\$ 9,229,000)

The Operation and Maintenance (O&M) costs associated with the inspecting and repairing the fence on the sand and gravel pit area on a yearly basis will cost \$5,200 (Table A-7). The O&M costs associated with the fluidized carbon bed and activated carbon are presented on Tables A-4 to A-6. These tables indicate that the annual costs for operating a fluidized carbon bed is approximately \$324,000 and for an activated carbon system is approximately \$311,000. Using these annual O&M costs and the capital costs, the 30-year present worth costs associated with maintaining the fence and remediating the contaminated groundwater for a 30 year treatment duration are:

ACTIVITY	30-YEAR PRESENT WORTH COST BASELINE
Buyout of the Carver Terrace subdivision	\$ 5,000,000
Demolition of the homes and the removal and disposal of the debris	960,000
Mechanical Soil Washing	2,070,000
Groundwater treatment utilizing fluidized carbon bed	4,365,000
(Groundwater treatment utilizing activated carbon)	(4,179,500)

Estimated Total	\$12,395,000 (\$12,209,500)

* Included in the estimated cost for Mechanical Soil Washing.

ATTACHMENT 3 - STATE OF TEXAS CONCURRENCE LETTER

John Hall, Chairman
B. J. Wyane, III, Commissioner
Pam Reed, Commissioner



TEXAS WATER COMMISSION

PROTECTING TEXANS' HEALTH AND SAFETY BY PREVENTING AND REDUCING POLLUTION

December 13, 1991

Mr. Myron O. Knudson, P.E., Director
Hazardous Waste Management Division
U. S. Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Re: Koppers Texarkana Superfund Site
Draft Amended Record of Decision

Dear Mr. Knudson:

We have reviewed and have no objection to the third draft of the amended record of decision (ROD) proposed for the Koppers Texarkana Superfund Site. This amended ROD would supplement the existing 1988 ROD by authorizing the buyout of the Carver Terrace portion of the site, providing relocation assistance to the affected residents, reclassifying the purchased residential area to non-residential use, and affirming the action level of 100 parts per million total carcinogenic polynuclear aromatic hydrocarbons (PAHs). These actions are also dependent upon satisfactory resolution of the on-going negotiations between the TWC and EPA pertaining to the Superfund State Contract (SSC). The SSC will provide the State's assurances to match ten percent of the buyout costs and to take title to the Carver Terrace properties once the remedial actions described in the amended and existing RODs are complete.

Sincerely,


Allen Bainske
Executive Director